Appln. No. 09/399,540
Amdt. dated May 11, 2004
Reply to Final Office Action of Mar. 9, 2004
Docket No. 6321-147

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the instant application:

Listing of Claims:

1.   (Currently Amended)   A method for distributed agent based non-expert simulation of manufacturing process behavior on a single-processor computer comprising the steps of:

    object modeling at least two different manufacturing techniques, each manufacturing technique having a plurality of processes, wherein said manufacturing techniques are selected from a plurality of different manufacturing techniques comprising a pull, a push, or a takt manufacturing technique;

    associating a distributed agent with each said process of each of said two different manufacturing techniques;

    programming each said agent to respond to discrete events corresponding to one of said two manufacturing techniques to which each said agent is associated, wherein each said discrete event triggers a programmed response, wherein the programming step comprises the step of conditioning each said agent to respond to a discrete event selected from the group consisting of a clock tick message, a resources received message, and a request for output production message; and

    comparing each modeled manufacturing technique according to user-specified input parameters.

2.   (Original)   The method according to claim 1, further comprising the step of transmitting said discrete events to each said agent in a message loop.

3.   (Canceled)

4.   (Previously Presented)   The method according to claim 13, wherein the programming step further comprises the steps of:

in response to said clock tick message, programming each said agent to place finished output in an output stack corresponding to said associated process;

in response to said resources received message; programming each said agent to initiate production of output using resources contained in an input stack corresponding to said associated process; and,

programming each said agent to pass to an agent associated with an upstream process any output in said output stack produced in response to said discrete event.

5.   (Original)   The method according to claim 13, wherein the programming step further comprises the steps of:

in response to said clock tick message, programming each said agent to place finished output in an output stack corresponding to said associated process;

in response to said resources received message, programming each said agent to inspect an input stack corresponding to said associated process, and to initiate production of output if said input stack has resources adequate to completely produce an output unit;

in response to said request for output production message, programming each said agent to inspect an output stack corresponding to said associated process for adequate output to satisfy said output production request, to inspect an input stack corresponding to said associated process only if said output stack lacks adequate output to satisfy said output production request, to initiate production of output if said input stack has resources adequate to completely produce output sufficient to satisfy said output request, and to post a request for output production message to an agent associated with a downstream process if said input stack lacks adequate resources to satisfy said output production request; and,

programming each said agent to pass to an agent associated with an upstream process any output in said output stack produced in response to said discrete event.

6.   (Original)   The method according to claim 4, wherein the programming step further comprises the steps of:

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setting a minimum output level of output in an output stack corresponding to a process;
and,

programming each said agent to produce replacement output in response to said output falling below said minimum output level.

7.   (Original)   The method according to claim 13, wherein the programming step further comprises the steps of:

in response to said clock tick message, programming each said agent to compare said clock tick message with a pre-specified takt time corresponding to said associated process; and,

in response to a clock tick message correlating to said pre-specified takt time, programming each said agent to place completed output in an output stack corresponding to said associated process, to retrieve resources contained in an input stack corresponding to said associated process, to initiate production of output using resources contained in said input stack, and to pass to an agent associated with an upstream process any output in said output stack.

8.   (Previously Presented)   A method for distributed agent-based simulation of manufacturing process behavior, the simulation having a plurality of agents corresponding to individual processes forming a manufacturing technique, the method comprising the steps of:

receiving a message from an agent associated with one of a plurality of different manufacturing techniques comprising a pull, a push, or a takt manufacturing technique;

identifying in said received message a discrete event selected from the group consisting of a clock tick event, a resources received event, and a request for output production event;

causing an associated process to perform an activity in response to said identified event;
and,

messaging an adjacent agent in response to said identified event.

9.   (Original)   The method according to claim 8, wherein said causing step comprises the steps of:

in response to said clock tick event, placing finished output in an output stack corresponding to said associated process;

in response to said resources received event, initiating production of output using resources contained in an input stack corresponding to said associated process; and,

passing to an agent associated with an upstream process any output in said output stack produced in response to said discrete event.

10.   (Original)   The method according to claim 8, wherein said causing step comprises the steps of:

in response to said clock tick event, placing finished output in an output stack corresponding to said associated process;

in response to said resources received event, inspecting an input stack corresponding to said associated process, and initiating production of output if said input stack has resources adequate to completely produce an output unit;

in response to said request for output production event, inspecting an output stack corresponding to said associated process for adequate output to satisfy said output production request, inspecting an input stack corresponding to said associated process only if said output stack lacks adequate output to satisfy said output production request, initiating production of output if said input stack has resources adequate to completely produce output sufficient to satisfy said output request, and posting a request for output production message to an agent associated with a downstream process if said input stack lacks adequate resources to satisfy said output production request; and,

passing to an agent associated with an upstream process any output in said output stack produced in response to said discrete event.

11.   (Original)   The method according to claim 10, wherein said causing step further comprises the steps of:

identifying a minimum output level of output in an output stack corresponding to a process; and,

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producing replacement output in response to said output falling below said minimum output level.

12.   (Original)   The method according to claim 8, wherein said causing step comprises the steps of:

in response to said clock tick event, comparing said clock tick event with a pre-specified takt time corresponding to said associated process; and,

in response to a clock tick event correlating to said pre-specified takt time, placing completed output in an output stack corresponding to said associated process, retrieving resources contained in an input stack corresponding to said associated process, initiating production of output using resources contained in said input stack, and passing to an agent associated with an upstream process any output in said output stack.

13.   (Previously Presented)   A computer apparatus programmed with a routine set of instructions stored in a fixed medium, the computer apparatus comprising:

means for receiving a message from an agent associated with one of a plurality of different manufacturing techniques comprising a pull, a push, or a takt manufacturing technique;

means for identifying in said received message a discrete event selected from the group consisting of a clock tick event, a resources received event, and a request for output production event;

means for causing an associated process to perform an activity in response to said identified event; and,

means for messaging an adjacent agent in response to said identified event.

14.   (Original)   The computer apparatus according to claim 13, wherein said causing means comprises:

in response to said clock tick event, means for placing finished output in an output stack corresponding to said associated process;

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in response to said resources received event, means for initiating production of output using resources contained in an input stack corresponding to said associated process; and,

means for passing to an agent associated with an upstream process any output in said output stack produced in response to said discrete event.

15. (Original) The computer apparatus according to claim 13, wherein said causing means comprises:

in response to said clock tick event, means for placing finished output in an output stack corresponding to said associated process;

in response to said resources received event, means for inspecting an input stack corresponding to said associated process, and initiating production of output if said input stack has resources adequate to completely produce an output unit;

in response to said request for output production event, means for inspecting an output stack corresponding to said associated process for adequate output to satisfy said output production request, inspecting an input stack corresponding to said associated process only if said output stack lacks adequate output to satisfy said output production request, initiating production of output if said input stack has resources adequate to completely produce output sufficient to satisfy said output request, and posting a request for output production message to an agent associated with a downstream process if said input stack lacks adequate resources to satisfy said output production request; and,

means for passing to an agent associated with an upstream process any output in said output stack produced in response to said discrete event.

16. (Original) The computer apparatus according to claim 15, wherein said causing means further comprises:

means for identifying a minimum output level of output in an output stack corresponding to a process; and,

means for producing replacement output in response to said output falling below said minimum output level.

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17.   (Original)   The method according to claim 13, wherein said causing means comprises the steps of:

in response to said clock tick event, means for comparing said clock tick event with a pre-specified takt time corresponding to said associated process; and,

in response to a clock tick event correlating to said pre-specified takt time, means for placing completed output in an output stack corresponding to said associated process, retrieving resources contained in an input stack corresponding to said associated process, initiating production of output using resources contained in said input stack, and passing to an agent associated with an upstream process any output in said output stack.

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